

WHAT IS CLAIMED IS:

1. An image processing apparatus comprising:

a grouping unit which groups input three-dimensional objects into groups;

a rendering processing unit which derives a subspace which contains the three-dimensional objects belonging to the same group to be an independent rendering unit and performs rendering processing individually on the subspace, and generates independent image data for each subspace; and

a consolidation unit which generates final output image data to be displayed by consolidating the image data generated for each subspace.

2. The apparatus of Claim 1, wherein the rendering processing unit comprises:

a coordinate transformation unit which derives a subspace which is a quadrangular truncated pyramid through perspective projection and performs perspective transformation of the three-dimensional object; and

a rendering unit which performs individual rendering processing in the quadrangular truncated pyramid.

3. The apparatus of Claim 1, wherein the grouping unit groups the three-dimensional objects based on motion characteristics of the three-dimensional objects.

4. The apparatus of Claim 2, wherein the grouping unit groups the three-dimensional objects based on motion characteristics of the three-dimensional objects.

5. The apparatus of Claim 1, wherein the grouping unit groups the three-dimensional objects based on information related to level of detail in rendering the three-dimensional objects.

6. The apparatus of Claim 2, wherein the grouping unit groups the three-dimensional objects based on information related to level of detail in rendering the three-dimensional objects.

7. The apparatus of Claim 1, wherein the consolidation unit corrects dynamic range of a depth value of each pixel of the image data generated for each subspace, and consolidates the

image data by comparing the corrected depth value and generates the final output image to be displayed.

8. The apparatus of Claim 2, wherein the consolidation unit corrects dynamic range of a depth value of each pixel of the image data generated for each subspace, and consolidates the image data by comparing the corrected depth value and generates the final output image to be displayed.

9. The apparatus of Claim 1, wherein the rendering processing unit comprises a plurality of rendering units and distributes the rendering processing to the plurality of the rendering units according to complexity level of the rendering processing by subspace unit.

10. The apparatus of Claim 2, wherein the rendering processing unit comprises a plurality of rendering units and distributes the rendering processing to the plurality of the rendering units according to complexity level of the rendering processing by subspace unit.

11. The apparatus of Claim 1, wherein the rendering

processing unit comprises a plurality of rendering units with different processing performance and assigns the rendering processing to the plurality of the rendering units, each of which has the appropriate processing performance corresponding to complexity level of the rendering processing by subspace unit.

12. The apparatus of Claim 2, wherein the rendering processing unit comprises a plurality of rendering units with different processing performance and assigns the rendering processing to the plurality of the rendering units, each of which has the appropriate processing performance corresponding to complexity level of the rendering processing by subspace unit.

13. The apparatus of Claim 1, further comprising a communication unit which receives image data rendered by subspace unit from an external distributed rendering processing device connected with the apparatus via a network, and wherein the consolidation unit consolidates the image data received from the external distributed rendering processing device with the image data generated by the

rendering processing unit and generates the final output image data to be displayed.

14. The apparatus of Claim 2, further comprising a communication unit which receives image data rendered by subspace unit from an external distributed rendering processing device connected with the apparatus via a network, and wherein the consolidation unit consolidates the image data received from the external distributed rendering processing device with the image data generated by the rendering processing unit and generates the final output image data to be displayed.

15. The apparatus of Claim 13, wherein the rendering processing is assigned to a plurality of the distributed rendering devices, each of which has different network distance corresponding to level of detail in rendering by subspace unit.

16. The apparatus of Claim 14, wherein the rendering processing is assigned to a plurality of the distributed rendering devices, each of which has different network

distance corresponding to level of detail in rendering by subspace unit.

17. An image processing system including a plurality of image processing apparatus for exchanging information with each other via a network and performing distributed rendering processing, the system comprising:

a grouping unit which groups input three-dimensional objects into groups;

a rendering processing unit which derives a subspace which contains the three-dimensional objects belonging to the same group to be an independent rendering unit and performs rendering processing individually on the subspace, and generates independent image data for each subspace; and

a consolidation unit which generates final output image to be displayed by consolidating the image data generated for each subspace, and

wherein the grouping unit, the rendering processing unit and the consolidation unit are functionally distributed among the plurality of the image processing apparatus.

18. An image processing apparatus for exchanging information

with other apparatus via a network, comprising at least one of function blocks of:

a grouping unit which groups input three-dimensional objects into groups;

a rendering processing unit which derives a subspace which contains the three-dimensional objects belonging to the same group to be an independent rendering unit and performs rendering processing individually on the subspace, and generates independent image data for each subspace; and

a consolidation unit which generates final output image to be displayed by consolidating the image data generated for each subspace, and

wherein a processing result by the function block which is not included in this apparatus is received from the other apparatus and utilized.

19. An image processing method comprising dividing a space into subspaces which overlap one another and performing rendering processing independently by subspace unit on a three-dimensional object in each of the subspaces, and consolidating rendering data of the three-dimensional object in each of the subspaces by evaluating a distance in depth

direction.

20. An image processing method comprising grouping a plurality of three-dimensional objects into groups and performing rendering processing individually on a subspace which contains at least one of the three-dimensional objects belonging to the same group, and generating final image data to be displayed by consolidating rendering data of each subspace.

21. A computer program executable by a computer, the program comprising:

reading array data of a plurality of three-dimensional objects;

grouping the three-dimensional objects which exist in a display area into groups;

deriving a subspace which contains the three-dimensional objects belonging to the same group to be an independent rendering unit;

performing rendering processing individually by subspace unit to generate image data for each subspace; and

generating final image data to be displayed in the



display area by consolidating the image data generated for each subspace.

22. The program of Claim 21, further comprising calculating a position of each of the three-dimensional objects in a viewpoint coordinate system and determining information related to level of detail in rendering each of the three-dimensional objects based on a distance from the viewpoint, and wherein said grouping groups the three-dimensional objects which exist in the display area into the groups according to the information related to level of detail.

23. The program of Claim 21, wherein the rendering processing are performed in such a manner that the rendering processing for each subspace is distributed to a plurality of rendering processing units.

24. The program of Claim 22, wherein the rendering processing are performed in such a manner that the rendering processing for each subspace is distributed to a plurality of rendering processing units.